1034.h.2
5

NEW PRACTICAL IMPROVEMENTS, AND OBSERVATIONS,

On Some of the

Experiments and *Conſiderations*
TOUCHING

COLOURS,

Of the HONOURABLE and JUDICIOUS
ROBERT BOYLE, Eſq;

So far as they relate to TINCTURES and PIGMENTS;

Intended for the Uſe of Gentlemen and Ladies that amuſe themſelves with Painting in Water Colours, as well as Deſigners and Limners, *&c.*

By *JOHN HOOFNAIL.*

LONDON:
Printed for R. GOSLING at the *Crown* and *Mitre* againſt
Fetter-Lane in *Fleet-ſtreet*, 1738.
(Price One Shilling.)

MVSEVM
BRITAN
NICVM

THE

PREFACE.

AS it may be thought a Preſumption in me to give this little Work the Name of Improvements on Mr *Boyle's* Experiments, as if I intended thereby to inſinuate that thoſe valuable Experiments were imperfect, I judg'd it not amiſs, by Way of Apology, to aſſure the Reader that I have too great an Eſteem for all the excellent Performances of that truly Noble and Experienced Author, not to pay them the Deference, and to peruſe them with that Admiration, they ſo juſtly deſerve.

When firſt I took theſe Eſſays into my Hands, I indeed expected (not knowing the Nature and Deſign of them 'till I read them) to find nothing but Recipes ready for me to apply directly to the Purpoſes I wanted them for; but I had not gone over ſome few of them without being ſoon convinced of my Miſtake, and eaſily diſcovered that the Honourable and Generous Author had deſigned theſe Elaborate Peices only, as Foundations for others to improve and build upon.

This indeed was a great Diſappointment to me, and render'd the Work I had in hand more difficult than I could have wiſh'd; but as I was determined to go through with what I had begun, the repeating and varying of the Proceſſes ſoon gave me the Satisfaction of ſeeing my unlook'd for and additional Trouble well rewarded with new and uſeful Appearances and Effects, which perhaps did not appear to that Gentleman, as he acted on more ſublime Principles, and with more extenſive Views than Perſons of my infinitely inferior Capacity can pretend to.

In this Senſe it is, therefore, that I have taken the Liberty of calling the few following *Tentamina*, Improvements on Mr *Boyle*'s

Experiments, and hope that, when taken in this Light, I ſhall not be cenſured by the World as aſſuming an improper Title, or of attempting to eclipſe the Glory of one of the greateſt Men the Learned World has ever been honoured with.

It may likewiſe be ſurmiſed, that the many Treatiſes that have appeared in the World on this Subject both before and after the Writing of Mr *Boyle*'s Eſſays, will make this Work unneceſſary, uſeleſs, and even ſuperfluous; to take away the Force of this Objection, I will only add, that as my natural Averſion to impoſe any Thing upon the Public, that was copied from others (as has been, too frequently done, without trying whether the Things they publiſhed were agreeable to Truth) would have been ſufficient to hinder me from this Undertaking, ſo I have offered nothing in the following Sheets, but what I have myſelf experienced. And as I don't remember to have ſeen any Thing herein contained, in the many Authors I have read on this Subject; I thought my Labours might not be altogether uſeleſs, unprofitable, or unacceptable to the curious as well as the Artiſt, to whoſe Patience and Favour I recommend them, and whoſe Approbation I ſhall be very proud of.

Note, *For the Eaſe and Conveniency of thoſe Readers, that have not Leiſure to have recourſe to Mr* Boyle's *Eſſays, and others who have not that Book by them, I have tranſcribed from that Author the Experiments whereon the following were made, and placed them at the Head of the Improvements on each of them; whereby it will at once appear what the Deſign of thoſe Experiments was, and of what Uſe my Operations thereon will be.*

THE
CONTENTS.

MR Boyle's *20th and 21ſt Experiments,* Pag. 2 *and* 4
Obſervations thereon 6
Various Tinctures made from Litmus 9
Lakes or Powders made from ditto 11
Mr Boyle's *22d Experiment* 12
Obſervations thereon 15
Several Tryals on Verdigreaſe 16
Uſeful Tinctures made of it 17
Powders made from it for painting in Oyl and Water ibid.
A good Green Tincture from Verdigreaſe to ſtain Ivory, &c. 20
Mr Boyle's *24th Experiment* 22
Obſervations thereon 24
Several Experiments on the Cochineals 26
Uſeful Tinctures made of them 27
Lakes from Cochineal 29
Tinctures from Kermes Berries and from Madder 31
Lakes from them ibid.
A Purple Tincture from Cochineal 32
Mr Boyle's *26th and 29th Experiments* 33, 34
Tryals and Obſervations thereon 40
Sap-Green conſidered ibid.
Tinctures made therefrom 41

Mr

The CONTENTS.

Mr Parkinſon's *Account of the Buckthorn Berries* Page 43
Remarks thereon 44
Conjectures about the Sap-Green 45
Mr Boyle's 49*th Experiment*, &c. 46
Obſervations thereon 49
A Yellow Powder from Sap-Green 51
A Yellow Tincture from the Berries of Avignon ibid.
A Yellow Lake, or Dutch *Pink from* ditto, ib.

Farther Remarks on the 49th Experiment. 52

A Yellow Tincture from Gamboge ibid.
A Yellow Tincture from Woold 54
A Powder from ditto ibid.
A Gold Colour Tincture from Anotto ibid.
A Powder from ditto ibid.
A Tincture from Japan Earth 55
A Powder from ditto 56
Some Conjectures and Thoughts concerning the Japan Earth ibid.
Directions for ſtaining Paper, with the before-mentioned Tinctures 57
The Preparation of the Pruſſian *Blue* 59
A Way to make Pruſſian *Green* 61
A Purple Powder on the ſame Baſis 62
A Yellow ditto ibid.
The Concluſion ibid.
Some additional Obſervations 63

PRACTICAL IMPROVEMENTS, &c.

THAT the Method I have taken in ſetting down the following Trials; by beginning at the twentieth of Mr *Boyle*'s Experiments; may not appear ſtrange and irregular, it will not be improper to acquaint the Reader, that hitherto I have found nothing in any of the preceding, intermediate, and the ſubſequent Experiments not here taken Notice of, but what either not related to, or interfered with the preſent Subject; and therefore make no Mention of them. This being what I thought neceſſary to premiſe, ſhall proceed to the Buſineſs.

EXPERIMENT XX.

“ TAKE good Syrup of Violets, “ impregnated with the Tincture “ of the Flowers, drop a little of it upon “ a white Paper (for by that Means the “ Change of Colour will be more conſpicuous, and the Experiment may be “ practiſed in ſmaller Quantities) and on “ this Liquor let fall two or three Drops “ of Spirit, either of Salt or Vinegar; or “ almoſt any other eminently Acid Liquor, and upon the Mixture of theſe “ you ſhall find the Syrup immediately “ turn'd Red, and the Way of effecting “ ſuch a Change, has not been unknown “ to divers Perſons who have produced “ the like, by Spirit of Vitriol, or Juice “ of Lemons, but have groundleſly aſcribed “ the Effect to ſome peculiar Quality of “ thoſe two Liquors, whereas (as we have “ already intimated) almoſt any Acid “ Salt will turn Syrup of Violets red. But “ to improve the Experiment, let me add “ what has not (that I know of) been

“ hitherto obſerved, and has, when we
“ firſt ſhewed it them, appear'd ſomething
“ ſtrange, even to thoſe that have been
“ inquiſitive into the Nature of Colours,
“ namely, that if inſtead of Spirit of Salt,
“ or that of Vinegar, you drop upon the
“ Syrup of Violets a little Oil of Tartar
“ *per Deliquium*, or the like Quantity of
“ Solution of Pot-aſhes, and rub them together
“ with your Finger, you ſhall find
“ the blue Colour of the Syrup turn'd in
“ a Moment into a perfect Green, and the
“ like may be perform'd by divers other
“ Liquors, as we may have Occaſion elſewhere
“ to inform you.

The Annotation on this Experiment differing little from what is there ſaid, except what relates to the *Lignum Nephriticum*, it is uſeleſs to tranſcribe it.

EXPERIMENT XXI.

" THERE is a Weed, more known " to Plowmen than beloved by " them, whoſe Flowers from their Colour " are commonly called Blew-bottles, and " Corn-weed, from their growing among " Corn. Theſe Flowers ſome Ladies do, " upon the Account of their lovely Colour, " think worth the being Candied; which " when they are, they will long retain ſo " fair a Colour, as makes them a very " fine Sallad in the Winter. But I have " tried, that when they are freſhly ga- " thered, they will afford a Juice which " when newly ex-preſs'd (for in ſome Caſes " 'twill ſoon enough degenerate) affords a " very deep and pleaſant Blew. Now (to " draw this to our preſent Scope) by drop- " ping on this freſh Juice a little Spirit " of Salt (that being the Acid Spirit I " had then at Hand) it immediately " turn'd (as I predicted) into a Red. " And, if inſtead of the four Spirit, I " mingled with it a little ſtrong So- " lution of an Alcalizate Salt, it did pre-

“ ſently diſcloſe a lovely Green ; the ſame
“ changes being by thoſe differing Sorts
“ of Saline Liquors, producible in this
“ Natural Juice, that we lately mention’d
“ to have happen’d to that factitious Mix-
“ ture, the Syrup of Violets. And I re-
“ member that finding this blew Liquor,
“ when freſhly made to be capable of
“ ſerving in a Pen for an Ink of that Co-
“ lour, I attempted by moiſt’ning one
“ Part of a Piece of white Paper with
“ the Spirit of Salt I have been men-
“ tioning, and another with ſome Alca-
“ lizate, or Volatile Liquor, to draw a
“ Line on the leiſurely dried Paper, that
“ ſhould, even before the Ink was dry,
“ appear partly Blew, partly Red, and
“ partly Green ; but though the latter
“ Part of the Experiment ſucceeded not
“ well (whether becauſe Volatile Salts are
“ too Fugitive to be retain’d in the Paper,
“ and Alcalizate ones are too Unctuous,
“ or ſo apt to draw Moiſture from the
“ Air, that they keep the Paper from dry-
“ ing well) yet the former Part ſucceeded
“ well enough ; the Blew and Red being
“ conſpicuous enough to afford a ſurpriſing
“ Spectacle to thoſe I acquaint not with
“ (what I willingly allow you to call) the
“ Trick.

There is but very little in theſe two Experiments, more than for Speculation; for if a Magiſtery be made, either of the ex-preſſed Juice of the Violets or Blue-bottles, or from the Tincture made by infuſing the Flowers dried, the Colours, whether Green or Blue, will be no more permanent than the Tinctures; for when uſed in Oil, they immediately turn red, and in Water colouring they will ſtand but a ſhort Time, which may be ſuppoſed the Reaſon why Pigments of theſe two Colours made from Vegetables have been long out of Uſe, notwithſtanding all the great Encomiums of ſeveral Authors on the Methods of making them after the Directions of *Neri* in his Art of Glaſs, of which Mr *Boyle* is likewiſe pleaſed to take ſome Notice at the Cloſe of his 49th Experiment.

What I have now ſaid, may alſo ſhew how likely it is to make a laſting Blue not inferior to Ultramarine, from the *Cyanus*, (mentioned in this XXIſt Experiment) after a Manuſcript of Mr *Boyle*, ſaid to be obtain'd from the late Lord *Carlton*; ſince by what I, as well as many more, have tried, it is not only improbable, but impoſſible to make that a durable Colour, which is naturally ſo ſubject to immediate Alteration on the Approach of an Acid, Alcalizate, or a ſulphureous Salt. It is true, that the Colour made from the Cyanus is not quite ſo ſoon chang'd, as that from Violets, the latter having more Red intermixt with the Blue, than the other; yet the Salts have the ſame Effect on the one as the other, which can by no means be prevented.

There are no Vegetable Subſtances (at leaſt amongſt the many that I have made Trials upon) from which Blue or Green Tinctures that are truly laſting can be produced: Even Indigo, which has ſuch a very great Body, is durable no Way but in printed Calicoes and Linnen; for, tho' it does laſt a long while in died Stuffs, it ſtill goes off in Time; and in Painting in Oil or Water it is ſo bad, that it is very rarely uſed. The lately invented Liquor alſo prepared thereof for ſtaining the Linnen and Calicoe, if not immediately uſed, will fade and die away. And as for the Pigment called *Litmus*, the Blue Tincture thereof, which is ſometimes made uſe of, is ſo changeable that the Air alone, without the Help of any Acid, will ſoon turn it Red. Nor is the Green Tincture made from the Violets, or Corn-Flowers, as taught in theſe two Experiments, more laſting than the Blue, the Greeneſs, how fine ſoever it does appear, preſently changes into a dirty brown, without the Addition of any Salt, and not to a Red as the blue Colours are apt to do. The Red Colour alſo that is produced from them by an Acid, is but of little Value, the firſt Beauty of the Colour ſoon flying off. What is mentioned in the Annotation on the XXth Experiment concerning the *Lignum Nephriticum*, is of no Service in the Way of Colouring, it's only Uſe being to ſhew the various Effects the Rays of Light have to produce and change ſome Colours, as may be more amply ſeen in the Xth Experiment, *pag.* 199, *&c.* for the Tincture of that Wood is but of a dirty yellow Colour, and can be turned to no other Uſe than it is there deſign'd for, with Reſpect to Colours, and therefore I ſhall take no farther notice of it. In the Annotation on the XXIſt Experiment, Mr *Boyle* ſays, ‘ That ‘ when he purpoſely diſſolved blue Vitriol ‘ in fair Water, and thereby ſufficiently ‘ imbued the Liquor with that Colour, a ‘ Lixiviate Liquor, and a Urinous Salt ‘ being copiouſly poured upon diſtinct ‘ Parcels of it did each of them, though ‘ perhaps with ſome Difference, turn the

" Liquor not Green but of deep yellowiſh " Colour, almoſt like that of Yellow Oker, " which Colour the precipitated Corpuſ- " cles retained, when they had leiſurely " ſubſided in the Bottom." How that judicious Gentleman came to aſſert this I cannot conceive, unleſs by miſtake he mentions Blue in the ſtead of White Vitriol; for the latter does yield ſuch a Tincture and Precipitation; which laſt, when freed from the Salts, may be uſed in the Painting way; but upon repeated Trials I have found that the Blue Vitriol treated in the Manner there mentioned, makes both a Tincture and a Powder of a pale Sea Green Colour.

As this Experiment relates chiefly to Blue Tinctures, it may not be foreign to the Subject to add here what uſe may be made of the Vegetable, known in the Shops by the name of *Litmus*, tho' the Hon. Mr *Boyle* does particularly mention his Trials thereon in the 44th *Exp. page* 333 and 334.

What that moſt ingenious Author ſays concerning the various Phænomina that appeared upon the Additions of different Salts, will in ſome caſes ſerve to our preſent purpoſe, ſo far as thoſe Salts are a means of producing two if not three of the Tinctures there ſet down; for that it is not at all practible to produce a Yellow from it that can be of any Uſe is, becauſe the Yellow Appearance in that Experiment proceeds only from the thinneſs of the Colour, and is no more than a too much diluted Red, changed to a Yellow by the Rays of Light falling on the Surface of the Liquor, as may be alſo obſerved in ſuch a diluted Purple Tincture of Cochineal, Logwood and ſuch like, that otherwiſe have not the leaſt Tint of Yellow: For by all the various Trials that I have made, I could never procure a Yellow Tincture like that of a Topaz from it.

The only Tinctures then, that I could make of it to be uſeful, were, a Blue, a Red inclining to Crimſon, and ſometimes a Purple, this laſt not always ſucceeding alike, the leaſt Acidity turning it Red. The Method that will beſt Anſwer making a Blue Tincture, that will be leaſt Subject to change Reddiſh, is, either to extract the Colour with a ſtrong *Lixivium* of Pot-Aſhes, or with Soap Lye: but great Care muſt be taken to let no Allum or any other Acid come to it; for any thing of that kind will not only deſtroy the Colour but precipitate it; and even in Spring Water it will not be ſo good a Blue.

To make a Red Tincture of *Litmus* is not ſo difficult, almoſt every thing, even the Air itſelf contributing thereto, as may be ſeen from the Cautions juſt now given about the Blue. To effect this you need only to infuſe a ſufficient quantity of *Litmus* in Allum Water, acidulated with a few Drops of *Aqua Fortis* or Spirits of Salt, and you will have a moſt beautiful Red Tincture, which being mixt with a little Gum Water, will ſerve for illuminating Maps and Prints, for Writing, or any other Purpoſes where Tinctures are uſeful.

Laſtly, To make a Purple Tincture there is no other way than by extracting the Colour in limpid Water without the help of any Salt, and if it is to be uſed with Gum, no other will do, but Shreds of Leather, or Gum *Tragacanth* boil'd in Water; for Gum *Arabic*, or *Senegal* will help to make it Red. It muſt alſo be obſerved that to make a Red Tincture more *Litmus* is required in Proportion to Water, than for the other two Colours, the *Acid* not drawing the Colour out ſo well as a *Lixiviate* Salt will do.

It will perhaps be here expected that I ſhould ſhew the way of making Powders or Magiſteries from the above Tinctures; but I found the making of them ſo difficult, and ſo much inferior to others that will be hereafter mentioned, that I thought it needleſs to ſpeak of it; yet if any Body ſhould be deſirous to try what may be done by them, it will be neceſſary to obſerve that a Purple Powder cannot be made from the *Litmus*, and that Powders are made from the other two Tinctures by precipitating them with the contrary *Menſtruums*; *viz.* the Blue with Allum Water, and the Red with Pot-aſh Water, which produces a very odd Effect; for the Blue Tincture will yield a Reddiſh Powder, and the Red a Blueiſh one.

EXPERIMENT XXII.

" OUR next Experiment will perhaps
" ſeem to be of a contrary Nature
" to the two former made upon Syrup
" of Violets, and Juice of Blue Bottles.
" For as in them by the Affuſion of Oyl of
" Tartar, a Blueiſh Liquor is made Green,
" ſo

" ſo in this by the ſole Mixture of the
" ſame Oyl, a Greeniſh Liquor becomes
" Blue. The Hint of this Experiment
" was given us by the Practice of ſome
" *Italian* Painters, who being wont to
" counterfeit *Ultra marine Azure* as they
" call it, by grinding Verdigreaſe with
" *Sal Armoniac*, and ſome other Saline
" Ingredients, and letting them rot (as
" they imagine) for a good while together
" in a Dunghill, we ſuppoſed that the
" Change of Colour wrought in the Verdigreaſe
" by this way of Preparation,
" muſt proceed from the Action of certain
" Volatile and Alcalizate Salts, abounding
" in ſome of the mingled Concretes,
" and brought to make a farther
" Diſſolution of the Copper abounding in
" the Verdigreaſe, and therefore conjectured
" that if both the Verdigreaſe and ſuch
" Salts were diſſolved in fair Water, the
" ſmall parts of both, being therein more
" ſubdivided and ſet at Liberty, would
" have better Acceſs to each other, and
" thereby incorporate much more ſuddenly:
" And accordingly we found, that
" if upon a ſtrong Solution of good
" *French* Verdigreaſe (for 'tis that we
" are wont to employ as the beſt) you
" pour a juſt quantity of Oyl of Tartar,

"and ſhake them well together, you "ſhall immediately ſee a notable Change "of Colour, and the Mixture will grow "thick and not tranſparent, but if you "ſtay a while, till the groſſer part be "precipitated to, and ſetled in the Bottom, "you may obtain a clear Liquor of a very "lovely Colour, and exceedingly delightful "to the Eye. But, you muſt have "a care to drop in a competent quantity "of Oil of Tartar, for elſe the Colour "will not be ſo deep and rich; and "if inſtead of this Oil you employ a "clear *Lixivium* of Pot-aſhes, you may "have an Azure ſomewhat lighter or "Paler than, and therefore differing from, "the former. And if inſtead of either "of theſe Liquors, you make uſe of Spirit "of Urine, or of Hartſhorn, you may "according to the Quantity and Quality "of the Spirit you pour in, obtain a farther "Variety (tho' ſcarce conſiderable) "of cæruleous Liquors: And yet lately by "the help of this Urinous Spirit we made "a Blue Liquor, which not a few ingenious "Perſons, and among them, ſome "whoſe Profeſſion makes them converſant "in Colours, have looked upon with "ſome wonder. But theſe Azure coloured "Liquors ſhou'd be free from

" the ſubſiding Matter, which the Salts
" of Tartar, or Urine precipitate out of
" them, rather by being decanted, than
" by Filtration: For by the latter of
" theſe Ways, we have ſometimes found
" the Colour of them very much im-
" paired, and little ſuperior to that of the
" groſſer Subſtance, that is left in the
" Filtre.

Altho' the Subject of this Experiment was not much for my Purpoſe, I was neverthleſs willing to make it as uſeful as I could to others, and therefore was induced to make the following Remarks thereon. As for the Hint the Author gives of the Practice of ſome *Italian* Painters who counterfeit the Colour of the *Ultramarine*, by grinding Verdigreaſe with *Sal Armoniac*, *&c.* and burying it ſo for ſome time in a Dunghill; I cannot ſee how that could Anſwer the Deſign, becauſe the ſtrong Acidity that is contained in the Verdigreaſe is ſo corroſive that it not only deſtroys all the Colours it comes near or is mixt with; but it is alſo impoſſible by any Means, either by Volatile or Alcalizate Salts, to prevent it's turning Green, as well when uſed in Oil, as in Water, the Air itſelf ſoon taking off all Reſemblance of Blue. Nevertheleſs,

vertheleſs, I had a mind to try if I could not find out ſome Means to deprive the Verdigreaſe from it's corroding Quality, or at leaſt ſo to blunt the Points of the Salts, as to render it more uſeful and leſs offenſive than it is at preſent: For this purpoſe I choſe rather to make uſe of diſtilled, than of crude Verdigreaſe, the latter yielding ſo little Colour in proportion to it's Bulk, whereas the other entirely diſſolves almoſt in all *Menſtruums*, and in ſome ſo well as to need no Filtration.

After having made as many Trials as I thought worth while, there were but two out of a great Number, that to me ſeemed to deſerve Notice; of both which I will ſet down the Proceſſes and Uſe.

Firſt I took an Ounce of the diſtilled Verdigreaſe, and having reduced it to a very fine Powder, diſſolved it in four Ounces of Spirits of Hartſhorn, which produced a very beautiful deep cæruleous Tincture: But tho' this Colour did appear of ſuch a rich Blue hue, that it rather inclined to a Purple than a Green, yet being put into a Vial and held between the Eye and the Light, the Surface diſcovered a faint Reſemblance of a Blue Green, and being wrote with, or ſpread on white Paper there was, as ſoon as dry, a manifeſt ſtrong Appearance of a Sea Green; which therefore I judged to be ſerviceable to Gentlemen that delighted in illuminating Perſpective Views, Maps, *&c.*

But to make the uſe of this Tincture as extenſive as I could, was deſirous to try what Effect it would have to precipitate the Verdigreaſe. To do this I proceeded according to the uſual Method of precipitating Acids with Alcaly's as before mentioned; but I found myſelf deceived by the Event; for the Verdigreaſe, tho' an Acid, would not be ſtruck down with a Lixiviate Alcaleous Liquor or Salt; wherefore I was obliged to have recourſe to another Method, and took ſome of my Allum Water (which is made by boiling an uncertain quantity of Allum in Water till all is diſſolved, and when quite cold, decanted from the Allum that ſubſides) and added it to an equal Proportion of the Tincture in a large Vial, when after a little Effervеſcence I had the Pleaſure to ſee a fine Blue Green Powder ſettle to the Bottom, which, being waſhed well with warm Water, till the Water came off as ſweet as it was put on, I ſpread on clean white Tiles to dry, in a Place free from Duſt. But if it happens that the Colour does not all precipitate at firſt, then the Tinctured Liquor muſt be poured off in another Vial, and precipitated with freſh Allum Water, till all the Colour is taken out of the *Menſtruum*; tho' this laſt Powder does not come off ſo deep as the firſt, becauſe of the additional quantity of Allum. By this method I perceived however, with great Satisfaction, that notwithſtanding that the Precipitation was performed with an Acid, the Powder was almoſt entirely free from thoſe corroding noxious Qualities, ſo pernicious and offenſive in the Verdigreaſe, which I imputed to it's being diſſolved in the Alcalizate Spirit. This Powder will readily incorporate with Gum Water and Oyl, and makes a very lively pleaſant Colour in both ways of Painting. I will freely acknowledge that it has not ſo great a Body as the Verdigreaſe, nor will bear ſo much white Lead as that, but then, on the other Hand, it is not ſo nauſeous, and covers better without White then the other does.

The ſecond way that I found beſt to free Verdigreaſe from it's bad Qualities, and to make it more durable, even in the Air, (on both which Accounts moſt People are deterred from uſing it) was by diſſolving the fine Powder in Allum Water, and precipitating it with a ſufficient quantity of Oyl of Tartar *per diliquium*, or a Lixivium of Pot-aſhes, by either of which a Green Powder is obtained, which being waſhed and dried as above, became equally uſeful to the firſt.

From theſe two Proceſſes it will be eaſily conceived how unlikely it is to bring Verdigreaſe to the Hue of *Ultra marine*; for if by diſſolving it in the moſt active Alcalizate Spirit, or præcipitating it with the ſtrongeſt lixivial Salt, nothing better than a Sea Green Powder can be produced, how can it with Reaſon be ſuppoſed that Grinding it with *Sal Armoniac* (which is an Acid) tho' mixt with Lime to make the Salt more volatile and active, and burying it in a Dunghill, ſhould ſo much alter the Colour as to make it a permanent Blue; and even to equal *Ultra marine?* For it will, I beleive, be allowed by all who are acquainted with the Nature of Volatiles, that let the Change that is occaſioned thereby in Colours, be what it will, as ſoon as the Volatile Particles are gone off, the

Original Matter differs little, if at all, from it's priſtine State, ſo that if any laſting Change can be procured, it muſt (in my humble Opinion) be done by a fixt Alcalizate Salt; and yet I have found by Experience that Verdigreaſe ground with Lime, which I think is as little liable to loſe it's Strength as any Alcaly whatſoever, tho' as well incorporated as poſſible, will, when mixt up with Oyl for Painting, ſoon acquire a perfect Green Tint, tho' before Mixture a beautiful Blue.

I have continued longer than I ſhould on this Subject, only to ſhew that the greateſt Men are not entirely free from the Impoſitions of artful, ill-deſigning Men, who can, for the Sake of Lucre, occaſionally aſſume the Appearance of Honeſty and Ingenuity to deceive Mankind, without Diſtinction or fear of being detected.

Yet before I leave treating on this Drug it may not be altogether unacceptable if I add a Proceſs communicated to me ſome Years ago by a Friend of mine, and which I have ſince often made uſe off with great Satisfaction. The Recipe is as follows.

Take of Diſtilled Verdigreaſe one Pound; Rheniſh Tartar four Ounces; let both be reduced to a very fine Powder and put into two Quarts of Water, and a Pint of the beſt Vinegar; when it has ſtood to digeſt three Days and three Nights, and the Veſſel ſhaked often in that Time, filter the Liquor thro' a Paper and boil it over a gentle Fire in the open Air, to the quantity of a Pint; but great Care muſt be taken that it boils not too hot, leaſt the Colour be burnt and ſpoiled. This is an excellent Green Tincture for illuminating Maps, Prints, *&c.* and may be uſed as Ink: It will likewiſe ſerve before it is boiled, for ſtaining of Ivory Green, by laying the Ivory therein for ſome Days, till it acquires, a deep Colour. The Smell of the Verdigreaſe may be taken off by putting the ſtained Ivory a Day or two in clear Urine.

N. B. *This Method of Staining has been approved of by ſeveral curious Perſons, as the beſt that has of late Years been practiſed.*

EXPERIMENT XXIV.

" IT may (*Pyrophilus*) ſomewhat ſerve " to illuſtrate, not only the Doctrine " of Pigments, and of Colours, but divers " other Parts of corpuſcular Philoſophy, " as that explicates Odours and many other " things, not as the Schools by airy Qualities, but by real though extremely minute Bodies; to examine how much of " the colourleſs Liquor a very ſmall Parcel of a Pigment may imbue with a " diſcernable Colour: And though there " be ſcarce any thing of Preciſeneſs to be " expected from ſuch Tryals, yet I preſumed, that, at leaſt, I ſhould be able " to ſhew a much farther Subdiviſion of " the Parts of Matter into viſible Particles, than I have hitherto found taken " notice of, and than moſt Men would " imagine; no Body, that I know of, having yet attempted to reduce this Matter " to any Meaſure. The Bodies the moſt

“ promiſing for ſuch a Purpoſe, might
“ ſeem to be the Metals, eſpecially Gold,
“ becauſe of the Minuteneſs of it's Parts,
“ which might be argu'd from the incomparable
“ Closeneſs of it's Texture. But
“ though we tried a Solution of Gold,
“ made in *Aqua Regia* firſt, and then
“ in fair Water, yet in Regard we were
“ to determine the Pigment we employed
“ not by Bulk but Weight; and becauſe
“ alſo, that the Yellow Colour of the
“ Gold is but a faint one in compariſon
“ of the deep Colour of Cochineal, we
“ rather choſe this to make our Tryals
“ with. But among divers of theſe it will
“ ſuffice to ſet down one, which was
“ carefully made in Veſſels conveniently
“ ſhap'd (and that in the Preſence of a
“ Witneſs or Aſſiſtant) the Sum whereof
“ I find among my *Adverſaria*, registered
“ in the following Words. To which
“ I ſhall only premiſe, to leſſen the Wonder
“ of ſo ſtrange a Diffuſion of the Pigment,
“ that Cochineal will be better diſſolved,
“ and have it's Colour far more
“ heightned by Spirit of Urine, than (I
“ ſay not by common Water itſelf, but)
“ by rectified Spirit of Wine itſelf. The
“ Note I ſpoke of is this; [One Grain of
“ Cochineal diſſolved in a pretty Quantity

" of Spirit of Urine, and then diſſolved
" farther by degrees in fair Water, impart-
" ed a diſcernable, tho' but a very faint
" Colour, to about ſix Glasfuls of Water,
" each of them, containing about Forty
" three Ounces and a half, which amounts
" to above a hundred twenty five times
" it's own Weight.]

N. B. *A few other Tryals on Cochineal are ſet down in the 32d and 44th Experiments; but as they were almoſt the ſame with theſe, I thought it needleſs to tranſcribe them.*

Mr *Boyle* has treated of Cochineal not only here, but promiſcuouſly with other Things in ſeveral Experiments, *viz.* 32*d* and 44*th*. But as his *Tentamina* are often occaſional, and ſometimes only in order to ſhew the great variety of Phænomina and Changes in the Juices and Tinctures of Vegetables, and other Drugs, by Alcalizate or Acid Salts, I thought it would beſt agree with my Deſign, to render thoſe uſeful Hints and ſpeculative Tryals practicable, to bring all that to me appeared likely to be ſerviceable under one Article, that the Reader might not have the Trouble of turning over many Leaves for what could be brought into a narrower Compaſs; I ſhall therefore ſet down the Improvements upon the ſeveral Experiments in the ſame Order as I have from Time to Time made them without Regard to the Courſe of the Experiments themſelves.

This little Inſect, called, Cochineal, abounds with ſo much Colour, that (as the learned Author truely obſerves) there are but few Things in the Animal, Vegetable or Mineral Kingdoms, whoſe Tincture can be ſo extenſively diffuſed; but then it is as certain, that there is ſcarce any Tincture more difficultly made permanent, than this of Cochineal. Spirit of Urine, or any other Alcalizate Spirit, or Lixivial Salt, does indeed moſt powerfully draw out and exalt the Colour, but it does at the ſame Time act ſo violently, that in a very ſhort Time the Colour will from a very deep Crimſon be thereby changed into a dirty Brown, inclining to Yellow; tho' Mr *Boyle* in his thirty-ſecond Experiment aſſures us, that by all his Tryals he could not make the Tincture of Cochineal incline to a Yellow.

This extraordinary Operation of the Urinous Spirits, *&c.* plainly ſhewed me that they were not proper to be employed to make a Tincture of Cochineal, unleſs for Curioſity's Sake, and accordingly put me upon trying in what Kind of *Menſtruum* the Tincture could be made moſt durable. I found that Spirits of Wine produced an exquiſite bright Colour, enclining pretty much to the Scarlet, particularly when the Spirit had firſt been acidulated with a few Drops of ſingle *Aqua Fortis*; but when I tried to write or draw Lines therewith on Paper, I perceived that by it's ſpreading or flowing it would be unfit for ſuch a Uſe, the Letters and Lines appearing very rough and ragged, which could not be prevented by Gum nor any other Method; ſo that the only Uſe I found it would be proper for, was to make a tranſparent Spirit Varniſh, where it makes a very beautiful Colour. Nevertheleſs the fine Colour of the Tincture tempted me to try to make a Scarlet Lake thereof, by a Præcipitation either with an Acid or an Alcaly; and accordingly to ſome of the Tincture, I added ſome *Lixivium* of Potaſhes, but this had no other Effect than to incorporate therewith, and turn the Colour on the Purple Hue: I then added to ſome more of the ſame Tincture a Quantity of Allum Water, expecting thereby to ſee the Colour ſtruck down, but inſtead of that, the Allum was præcipitated by the Spirit alone, in a White Powder, and the Colour left ſuſpended in the Liquor. Theſe Tryals convinced me that a Tincture made with Spirit of Wine was no farther uſeful than before-mentioned, and obliged me to think of other Methods.

After ſeveral Experiments (all which it will be needleſs to take notice of, as they varied only in a few inconſiderable Particulars) two of them only ſucceeded according to my Wiſh, the Proceſſes whereof are as follows:

The moſt laſting Tincture that can be made to be uſeful is thus performed.

Boil two Ounces of Rheniſh (or for want of that half an Ounce of Cream of) Tartar powdered in a Pint of *Thames* Water about an Hour, after which, when it is cold and ſettled, decant off the Water, and mix with it an equal Quantity of Allum Water, adding ten or twelve Drops of ſingle *Aqua Fortis*. Into this Mixture put two Drams of the beſt Cochineal powdered, let it infuſe near five Hours by a gentle Heat, or in the warm Sun; and after that, firſt ſtrain it through a linnen Cloth, preſſing all the Liquor from the *Fæces*, and then filter it thro' Paper, when you will have a fine deep Scarlet Tincture, which may be mixt with Gum Water, or a Decoction of Shreds of Leather, will ſerve for Writing, and Illuminating, and may be, by the Addition of a little Roſe-Water, preſerved a long Time without growing Mothery and from Decay, being kept cloſe ſtopped.

Another rich Tincture can alſo be made by boiling or infuſing the Cochineal in Allum Water alone, which will be as durable as the former, and may do very well for ſome Intentions; but as it is nothing of a Scarlet, but a bright Crimſon Colour, I thought it ſufficient ſlightly to mention it, and chiefly as the next following Proceſs for making a good Lake is for the moſt Part upon the ſame Baſis.

All the Methods that I have read for making a red Lake are either fallacious or good for little: For as they are principally made from Cochineal, or rather Shreds of Scarlet Cloth or Stuffs, boiled in a *Lixivium* of Pot-Aſhes, and precipitated with Allum Water, the Lake can never be but of a Purpliſh Hue, and that not quite ſo beautiful as it ſhould be, becauſe the Activity of Alcalizate Salt does ſomewhat impair the Colour of the Cochineal before the Præcipitation is performed: And that made from the Shreds is ſo weak, unleſs ex-

extracted with exceeding ſtrong *Lixivium*, that the Lake cant have half Body enough to ſatisfy the Limners.

Therefore after repeated Tryals I thought the two ſubſequent Methods were not unworthy to be recommended as preferable to thoſe above taken Notice of.

The firſt is made by infuſing a Dram of fine powdered Cochineal into a Pint of Allum Water, placing it near a gentle Fire to boil ſoftly about four or five Hours; then let it grow cold and ſettle, after which pour it off from the ſubſiding *Fæces* into a clean Veſſel: On the *Fæces* I put another half pint of Allum Water and boyled as before about half an Hour to draw out all the Colour of the Cochineal: This I ſtrained thro' a Cloth, preſſing all the Tincture out of the Powder, and added it to the other Tincture, and filtered altogether thro' a Paper, into a clean Vial: Then I made a Solution of an Ounce of Salt of Tartar in a Quart of Water, and after having filtered that too, added it to the Tincture of Cochineal in a large, clean, glazed Pan or a Glaſs, that the Ebullition may not go over the Edge of the Veſſel. After the Efferveſcenſe is over the Red Powder will ſubſide, from which the Liquor was gently poured off; and if that ſtill retained a deepiſh Colour, ſome more of the

Solution of Salt of Tartar was put thereto, that all the Colour might be præcipitated, and the almoſt colourleſs Water poured off; after that a large Quantity of diſtilled or other clear Water was put on the Powder, to be waſhed therewith till it came off as inſipid as it was poured on, obſerving always to let the Colour ſettle well before the Water was decanted from it; This done, I dry'd the Powder by ſpreading it on Tiles, as before mentioned in making the Green, and I had the Satisfaction of obtaining a fine Lake, nothing inferior to the *Florentine*, which might have been made up into little Grains in the manner Lakes are met with in the Shops: Tho' I would rather adviſe the Maker to keep this, as all other Colours in the Powder, becauſe, to make them up in theſe little Grains, they muſt be ground up with Starch or other Matter to make them ſtick together, whereby the Body of the Colours is not only weakned, but likewiſe make them apt to grow fat and unwilling to dry, as is experienced by thoſe that uſe them in Oyl. But as I perceived that this, like the *Florentine* Lake, inclined a little too much towards the Purple, againſt which Quality the Limners mightily exclaim, I employed my Thoughts to find out one that ſhould not be liable to that Objection, and for that Purpoſe made Tryal on many of the Vegetables that yield Red Tinctures, many of theſe I found to be, either not at all durable in Air, or Subject to change on the approach of Saline and Sulphureous Qualities, or naturally very nearly border on the Purple. Of all the Drugs I tried, Kermes Berries and Madder beſt anſwer'd my Deſires; but as the firſt are ſcarce and dear, I confined myſelf to the latter, which is cheaper and eaſier to be had. Of this I made a Tincture by infuſing two Ounces of the beſt Crap, in a Pint of Allum Water, near a gentle Fire about the Space of two Hours, and then, after having let it ſettle about Twenty Four Hours, I filtered it thro' a Paper. Of this Tincture alone a Scarlet Lake was made by præcipitating the Tincture with a *Lixivium* of Salt of Tartar, and afterwards waſhed and dried as before directed. But as I did not think this Lake from the Madder, *per Se*, beautiful enough, I mixed the Tincture of Madder with about a fourth of it's Quantity of the abovementioned Tincture of Cochineal, and then præcipitated it as before, which produced a much finer Lake. Yet this muſt be obſerved that as all Madder does not give an equal Quantity of

Colour, it will be neceſſary to make a few Tryals, before you proceed to make the Lake. The Kermes Berries do likewiſe make a fine Scarlet Tincture by boiling an Ounce of them in about a Pint of Roch-Allum Water, adding a few Drops of Oyl of Sulphur.

N. B. *By putting a little* Sal Martis, *or a piece of Steel into the Tincture of Cochineal, it will be changed into a lovely Purple; which is not only directly contrary to the Operation of all other* Acid, *or* Metallic *Salts, whereby the Tincture of Cochineal is uſually turned towards a Yellow; but is even more than can be effected by any* Alcaly *that I know of.*

Experiment XXVI.

“ AND (firſt) I thought fit to try the
“ Operation of Acid Salts upon
“ Vegetable Subſtances, that are already
“ and by their own Nature Red. And
“ accordingly I made Tryal upon Syrrup of
“ Clove July-flowers, the clear expreſs'd
“ Juice of the ſucculent Berries of *Spina*
“ *Cervina*, or Buckthorn, (which I had
“ long kept by me for the ſake of it's
“ deep Colour) upon Red Roſes, Infuſion
“ of Brazil, and divers other Vegetable
“ Subſtances, on ſome of which cruſh'd (as
“ is often mentioned) upon White Paper,
“ which is alſo to be underſtood in moſt
“ of theſe Experiments, if no Circum-
“ ſtance of them argue otherwiſe; Spirit
“ of Salt either made no conſiderable
“ Change, or altered the Colour but from
“ darker to a lighter Red. How it will
“ ſucceed in many other Vegetable Juices
“ and Infuſions of the ſame Colour I have

“ at preſent ſo few at hand, that I muſt “ leave you to find it out your ſelf. But “ as for the Operation of other ſorts of “ Salts, upon theſe Red Subſtances, I found “ it not very uniform, ſome Red or “ Reddiſh Infuſions, as of Roſes, being turned thereby into a dirty Colour, “ but yet inclining to Green. Nor was “ the Syrrup of Clove July-flowers turned by the Solution of Pot-aſhes to a “ much better Colour. Another Sort of “ Red Infuſions was by an Alcaly not “ turned into a Green, but advanced into a Crimſon, as I ſhall have occaſion to note e're long. But there were “ other Sorts, as particularly the lovely “ coloured Juice of Buckthorn Berries, “ that readily paſs'd into a lovely Green.

EXPERIMENT. XXIX.

“ IT may be of ſome Uſe towards “ the Diſcovery of the Nature of “ theſe Changes, which the Alimental “ Juice receives in ſome Vegetables, according to the differing Degrees of their “ Maturity, and according to the differing

“ Kinds of Plants of the ſame Denomination, to obſerve what Operation Acid, Urinous, and Alcalizate Salts will have upon the Juices of the ſeveral Sorts of the Vegetable Subſtances I have been mentioning. To declare my Meaning by an Example, I took from the ſame Cluſter, one Blackberry full ripe, and another that had not yet gone beyond a Redneſs, and rubbing a Piece of White Paper with the former, I obſerv'd that the Juice adhering to it was of a dark Reddiſh Colour, full of little Black Specks, and that this Juice by a Drop of a ſtrong *Lixivium* was immediately turn'd into a Greeniſh Colour deep enough, by as much Urinous Spirit into a Colour much of Kin to the former, though ſomewhat differing, and fainter; and by a Drop of Spirit of Salt into a fine and lightſome Red: whereas the Red Berry being in like manner rubb'd upon Paper, left on it a Red Colour, which was very little alter'd by the Acid Spirit newly nam'd, and by the Urinous and Lixiviate Salts receiv'd Changes of Colours differing from thoſe that had been juſt before produced in the dark Juice of the ripe Blackberry. I remember alſo, that though the Infuſion of Damask

“ Roſes would as well, though not ſo much,
“ as that of Red, be heightened by *Acid*
“ Spirits to an intenſe degree of Redneſs,
“ and by *Lixiviate* Salts be brought to a
“ darkiſh Green; yet having for Tryal ſake
“ taken a Roſe, whoſe Leaves, which
“ were large and numerous, like thoſe of
“ a Province Roſe, were a perfectly Yellow,
“ though in a Solution of Salt of
“ Tartar, they afforded a Green Blewiſh
“ Tincture, yet I did not by an Acid
“ Liquor obtain a Red one; all that the
“ Saline Spirit I employ'd perform'd, being
“ (if I much miſ-remember not) to dilute
“ ſomewhat the Yellowneſs of the
“ Leaves. I would alſo have tried the
“ Tincture of Yellow Violets, but could
“ procure none. And if I were in thoſe
“ Iſlands of *Banda*, which are made Famous
“ as well as Rich, by being the almoſt
“ only Places, where Cloves will
“ proſper, I ſhou'd think it worth my
“ Curioſity to try, what Operation the
“ three different Kinds of Salts, I have ſo
“ often mentioned, would have upon the
“ Juice of this Spice, (expreſs'd at the ſeveral
“ Seaſons of it) as it grows upon
“ the Tree. Since good Authors inform
“ us (of what is remarkable) that theſe,
“ whether Fruits or Rudiments of Fruits,

“ are at firſt white, afterward Green, and
“ then Reddiſh before they be beaten off
“ the Tree, after which being dry'd be-
“ fore they are put up, they grow Blackiſh
“ as we ſee them. And one of the re-
“ centeſt Herbariſts informs us, that the
“ Flower grows upon the Top of the
“ Clove itſelf, conſiſting of four ſmall
“ Leaves, like a Cherry-Bloſſom, but of
“ an excellent Blew. But to return to our
“ own Obſervations, I ſhall add, that I
“ the rather chuſe to mention to you an
“ Example drawn from Roſes, becauſe
“ that though I am apt to think, as I
“ elſewhere advertiſe, that ſomething may
“ be gueſs'd at about ſome of the Quali-
“ ties of the Juices of Vegetables, by the
“ Reſemblance or Diſparity that we meet
“ with in the Changes made of their Co-
“ lours, by the Operation of the ſame
“ Kinds of Salts; yet that thoſe Conjec-
“ tures ſhould be very warily made, may
“ appear among other things, by the In-
“ ſtance I have choſen to give in Roſes.
“ For (though as I formerly told you) the
“ dry'd Leaves both of the Damask and
“ of Red ones, give a Red Tincture to
“ Water ſharpen'd with Acid Salts; yet
“ the one Sort of Leaves is known to
“ have a purgative Faculty, and the other

“ are often, and divers Ways employ'd “ for Binding.

“ And I alſo chuſe to ſubjoin this “ twenty ninth Experiment to thoſe that “ precede it, about the Change of the “ Colours of Vegetables by Salts, for theſe “ two Reaſons: The firſt, that you may “ not eaſily entertain Suſpicions, if in the “ Tryals of an Experiment of ſome of the “ Kinds formerly mention'd, you ſhould “ meet with an Event ſomewhat differing “ from what my Relations may have “ made you expect. And the ſecond, that “ you may hereby be invited to diſcern, “ that it may not be amiſs to take notice “ of the particular Seaſons wherein you “ gather the Vegetables which in nicer Ex“periments you make uſe of. For, if I “ were not hindred both by haſte and “ ſome juſtifiable Conſiderations, I could “ perhaps add conſiderable Inſtances to “ thoſe lately deliver'd, for the making “ out of this Obſervation; but for certain “ Reaſons I ſhall at preſent ſubſtitute a “ remarkable Paſſage to be met with in “ that Laborious Herbariſt Mr *Parkinſon*, “ where treating of the Vertues of the al“ready divers times mention'd Buckthorn “ Berries, he ſubjoins the following Ac“count of ſeveral Pigments that are made

" of them, not only according to the ſeveral
" Ways of handling them, but according
" to the different Seaſons of Maturity,
" at which they are gather'd:
" And I remember that I tried, with a
" Succeſs that pleas'd me well enough, to
" make ſuch a Kind of Pigment, as Painters
" uſually call Sap-Green, by a way not
" unlike that, deliver'd here by our Author,
" but I cannot find any thing relating
" to that Matter among my looſe
" Papers, And my Tryals were made ſo
" many Years ago, that I dare not truſt
" my Memory for Circumſtances, but I
" will rather tell you that in a noted Colour
" Shop, I brought them by Queſtions
" to confeſs to me, that they made their
" Sap-Green much after the Ways by our
" Botaniſt here mention'd. And on this
" occaſion I ſhall add an Obſervation
" which, though it does not ſtrictly belong
" to this Place, may well enough be mentioned
" here; namely, that I find by an
" Account given us by the Learned *Cluſius*
" of *Alaternus*, that even the groſſer
" Parts of the ſame Plant are ſome of
" them one Colour, and ſome another;
" For ſpeaking of that Plant; he tells
" us, that the *Portugals* uſe the Bark to
" dye their Nets into a Red Colour, and

“ with the Chips of the Wood, which
“ are Whitiſh, they dye a Blackiſh Blew.”

The Tryals that come next to be taken notice of are but a Part of theſe Experiments (the reſt being of no uſe to my preſent Deſign) yet I hope what I have ſet down relating thereto will be ſerviceable. In my Search for a good Green I tried, amongſt other Things, what this Juice of Buckthorn Berries would do; but I ſoon perceived that not much could be effected therewith, for when I had inſpiſſated it to a thick Extract with the greateſt Caution to prevent it's burning, it yielded but a very bad dirty Green: Beſides that, the Tincture of the Juice is ſo faint that it required a great deal of Trouble and Expence to inſpiſſate a quantity of Juice ſufficient to make proper Tryals upon; both which, as well as the Change that the Acids made in the Colour, diſcouraged me from attempting any thing farther with it. I had, however, recourſe to a Pigment ſaid to be made of this Juice, called in the Shops, by the Name of Sap-Green, which was not only ready prepared to my hand, but promiſed ſomething conſiderable to be performed by it. There are two Sorts of this Sap-Green ſold; the one

Engliſh, the other *French*. The firſt does not ſo readily diſſolve in Water as the latter, and inclines much more to the Yellow: Therefore I choſe to make uſe of the laſt. To make a Green Tincture of any degree of Strength, far exceeding the Juice of the Buckthorn, there needs no more trouble than to diſſolve it in fair cold Water, in which it will ſerve for illuminating Maps, Prints, *&c.* without the Addition of any Gum: And if a little Vinegar is put into the Water it will turn it more Green; but it muſt be obſerved that it will require to be made freſh as often as the Colour appears to decay, or yellowiſh. To make this Tincture of a more pleaſant Green, ſome fine Powder of diſtilled Verdigreaſe may be added at Pleaſure; only giving it a proper Time to diſſolve and incorporate therewith, whereby the Colour may be varied, more Yellow or Green, and deeper or paler as Occaſion ſhall make it neceſſary. I muſt alſo put you in Mind that with or without the Verdigreaſe, the Tincture ſhould be filtered thro' Paper before it is uſed.

The ſecond Uſe that is to be made of this Sap-Green, is to procure from it a fine Lemon Yellow Tincture, that will anſwer the End of the Green gathered Buckthorn Berries, which Mr *Parkinſon*

" with the Chips of the Wood, which
" are Whitiſh, they dye a Blackiſh Blew."

The Tryals that come next to be taken notice of are but a Part of theſe Experiments (the reſt being of no uſe to my preſent Deſign) yet I hope what I have ſet down relating thereto will be ſerviceable. In my Search for a good Green I tried, amongſt other Things, what this Juice of Buckthorn Berries would do; but I ſoon perceived that not much could be effected therewith, for when I had inſpiſſated it to a thick Extract with the greateſt Caution to prevent it's burning, it yielded but a very bad dirty Green: Beſides that, the Tincture of the Juice is ſo faint that it required a great deal of Trouble and Expence to inſpiſſate a quantity of Juice ſufficient to make proper Tryals upon; both which, as well as the Change that the Acids made in the Colour, diſcouraged me from attempting any thing farther with it. I had, however, recourſe to a Pigment ſaid to be made of this Juice, called in the Shops, by the Name of Sap-Green, which was not only ready prepared to my hand, but promiſed ſomething conſiderable to be performed by it. There are two Sorts of this Sap-Green ſold; the one

Engliſh, the other *French*. The firſt does not ſo readily diſſolve in Water as the latter, and inclines much more to the Yellow: Therefore I choſe to make uſe of the laſt. To make a Green Tincture of any degree of Strength, far exceeding the Juice of the Buckthorn, there needs no more trouble than to diſſolve it in fair cold Water, in which it will ſerve for illuminating Maps, Prints, *&c.* without the Addition of any Gum: And if a little Vinegar is put into the Water it will turn it more Green; but it muſt be obſerved that it will require to be made freſh as often as the Colour appears to decay, or yellowiſh. To make this Tincture of a more pleaſant Green, ſome fine Powder of diſtilled Verdigreaſe may be added at Pleaſure; only giving it a proper Time to diſſolve and incorporate therewith, whereby the Colour may be varied, more Yellow or Green, and deeper or paler as Occaſion ſhall make it neceſſary. I muſt alſo put you in Mind that with or without the Verdigreaſe, the Tincture ſhould be filtered thro' Paper before it is uſed.

The ſecond Uſe that is to be made of this Sap-Green, is to procure from it a fine Lemon Yellow Tincture, that will anſwer the End of the Green gathered Buckthorn Berries, which Mr *Parkinſon* ſays are uſed for that Purpoſe. To do this, take twenty four Grains of the Sap, diſſolve it, (finely powdered) with an equal Quantity of Salt of Tartar in four Ounces of warm Water, and in three or four Hours Time you will have a beautiful Colour, which muſt likewiſe be filtered and will be fit for any of the above-mentioned Uſes.

This laſt Proceſs ſhould more properly have been inſerted where I treat of the Experiments relating to Yellow Pigments, but as it was on the Baſis of the Sap-Green, I thought it would not come in amiſs here, it being the Subject of theſe Experiments. There may alſo be made of this Drug, a fine Red Tincture, that will ſerve inſtead of ſome of the Reds before ſpoken of, and this is done only by diſſolving it in Water, acidulated with a few Drops of ſingle *Aqua Fortis*; but of this Red Tincture no Red Powder or Lake can be made, for upon Præcipitation, which muſt be performed by an Alcaly, the Powder will be of a Greeniſh Yellow Colour: Nor can there be a Green Powder made of it, becauſe it can be diſſolved in no Acid or Saline *Menſtruum*, except Vinegar, to make a Green Tincture, and then whatever it is præcipitated with will turn it a Yellow. I ſhould now proceed to the 49th Experiment; but I will firſt ſay ſomething relating to Mr *Boyle*'s Quotation from *Parkinſon* concerning the Buckthorn Berries, and Sap-Green, in the latter Part of the 29th Experiment.

Mr *Parkinſon* ſays, 'That of theſe Berries 'are made three ſeveral Sorts of Colours as 'they ſhall be gathered, that is, being gathered while they are Green, and kept 'dry, they are called Sap-Berries, which 'being ſteep'd into ſome Allum Water, or 'freſh bruiſed into ſome Allum Water, they 'give a reaſonable, fair, Yellow Colour, 'which Painters Uſe for their Work, and 'Book-binders to colour the Edges of Books, 'and Leather-dreſſers to colour Leather, 'as they uſe alſo to make a Green Colour, 'call'd Sap-Green, taken from the Berries 'when they are Black, being bruiſed and 'put into a Braſs or Copper Kettle or Pan, 'and there ſuffered to abide three or four 'Days, or a little heated upon the Fire, 'and ſome beaten Allum put into them, 'and afterwards preſs'd forth, the Juice or 'Liquor is uſually put in great Bladders tied 'with ſtrong Thread at the head and hung 'up until it be dry; which is diſſolved in 'Water or Wine, or Sack, which laſt he 'affirms is the beſt to preſerve the Colour 'from ſtarving or decaying, and make it 'hold freſh the longer. The Third Colour 'is a Purpliſh, made from the Berries ſuffered to grow upon the Buſhes till the

‘ middle or end of *November*, when they ‘ are ready to drop from the Trees.’

The Truth of this Account I can't contradict, having never had Opportunity nor Leiſure to try the Berries of theſe different Degrees of Maturity; but will beg leave to obſerve on the firſt Part thereof, that the Yellow Colour uſed by Painters (called in the Shops *Dutch* Pink) and the Tincture wherewith, I think, Bookbinders generally colour their Leaves, and Leather-dreſſers their Leather, is made of *French* Berries of *Avignon*, that grow on the Box-Thorn, and are called Sap-Berries as may be ſeen in *Pomet*'s Hiſtory of Drugs, *Pag.* 21. which Berries differ in all Reſpects from thoſe of the *Spina Cervina*, or Buckthorn.

The ſecond Part of the Account concerning the Sap-Green is confirmed as well by Mr *Boyle*, in the ſame 29th Experiment, as by *Pomet*'s Hiſtory of Drugs, *B.* ix. *Pag.* 223. in the Article of *Rocou.* But nevertheleſs, I think there is ſome reaſon to doubt whether all, or the beſt, Sap-Green is made of the Buckthorn Berries; for beſides what I have before hinted about inſpiſſating the Juice, I could never find that Allum would change the Tincture of Sap-Green Red, as Mr *Boyle* aſſerts of this Juice, but to a bright Yellow, as appears from the forementioned fine Lemon coloured Tincture. Poſſibly the *Engliſh* Sap is made of the Buckthorn Juice, according to Mr *Parkinſon's* Relation, becauſe I always found that to have leſs Body, more Yellow, and harder to diſſolve than the *French*. To this might be added, that if the Sap-Green is made of the Juice of Buckthorn Berries, it is ſomething of a Wonder it has not yet been introduced into Phyſic as a Cathartic (having been known long enough) inſtead of the Juice, which can be had but once a Year, and requires ſo much Trouble and Room to preſerve it all the Year, when the Sap may be had always, and is diſſolved in a few Minutes, if the Quantity for a Doſe is once fixt. Wherefore I ſhould rather imagine the Sap-Green to be made from young Leeks, (as the *Greek* Name *Praſinon*, and *Latin Praſinus* or *Porraceus* imports) or from ſome other Plant that abounds with a more deep tinctured Green Juice, than that of the Buckthorn Berries. But as this is my private Notion, which I have not had Experience enough to be aſſured of, I will ſubmit to the Authority of theſe two Gentlemen that have obliged the World with ſuch excellent Works. What is contain'd in the third Part I know nothing of, there being at preſent no purple Colour to be met with in the Shops, beſides Turnſole, which, according to Mr *Parkinſon*'s Account, quoted by Mr *Boyle* in his 36th Experiment of this Eſſay, is made of another Berry; ſo ſhall leave this Subject, and go on to my Tryals on Experiment 49.

EXPERIMENT. XLIX.

" MEETING the other Day in
" an *Italian* Book, that treats of
" other Matters, with a Way of preparing
" what the Author calls a *Lacca* of Vege-
" tables, by which the *Italians*, mean a
" Kind of Extract fit for Painting, like
" that rich *Lacca* in *Engliſh*, commonly
" called *Lake*, which is employ'd by
" Painters as a glorious Red: And finding
" the Experiment not to be inconſiderable
" and very defectively ſet down, it will
" not be amiſs to acquaint you with what
" ſome Tryals have informed us, in refe-
" rence to this Experiment; which both
" by our *Italian* Authors and by divers of
" his Countrymen, is look'd upon as no
" trifling Secret.

" Take then the Root call'd in *Latin*
" *Curcuma*, and in *Engliſh* Turmerick,

“ (which I made uſe of, becauſe it was “ then at hand, and is among Vegetables “ fit for that Purpoſe one the moſt ea- “ ſieſt to be had) and when it is beaten, “ put what Quantity of it you pleaſe into “ fair Water, adding to every Pound of “ Water about a Spoonfull or better, of “ as ſtrong a *Lixivium* or Solution of “ Pot-aſhes as you can well make, clari- “ fying it by Filtration before you put it “ to the decocting Water. Let theſe “ Things boil or rather ſimper over a ſoft “ Fire, in a clean glaz'd Earthen Veſſel, “ till you find by the Immerſion of a Sheet “ of White Paper (or by ſome other way “ of Tryal) that the Liquor is ſufficiently “ impregnated with the Golden Tincture “ of the Turmerick; then take the De- “ coction off the Fire, and filter or ſtrain “ it, that it may be clean, and leiſurely “ dropping into a ſtrong Solution of Roch “ Allum, you ſhall find the Decoction, as it “ were curdled, and the tincted Part of it “ either to emerge, to ſubſide, or to ſwim up “ and down like little Yellow Flakes; and if “ you pour the Mixture into a Funnel lin'd “ with Cap Paper, the Liquor that filtred “ formerly ſo Yellow, will now paſs clean “ through the Filter, leaving it's tincted, “ and as it were curdled Part in the Filtre, “ upon which fair Water muſt be ſo often

“ pour'd, till you have dulcified the Mat-
“ ter therein contain'd, the Sign of which
“ Dulcification is when the Water that has
“ paſs'd through it, comes from it as taſte-
“ leſs as it was when pour'd on it. And if
“ without Filtration you would gather to-
“ gether the Flakes of this Vegetable
“ Lake, you muſt pour a great Quantity
“ of Water upon the Decoction after the
“ Affuſion of the Alluminous Solution,
“ and you ſhall find the Liquor to grow
“ clearer, and the Lake to ſettle together
“ at the Bottom, or emerge to the Top
“ of the Water, though ſometimes having
“ not pour'd out a ſufficient Quantity of
“ fair Water, we have obſerv'd the Lake
“ partly to ſubſide, and partly to emerge,
“ leaving all the middle of the Liquor
“ clear. But to make this Lake fit for
“ Uſe, it muſt by repeated Affuſions of
“ freſh Water, be dulcified from the ad-
“ hering Salts, as well as that ſeparated
“ by Filtration, and be ſpread and ſuffer'd
“ to dry leiſurely upon Pieces of Cloth,
“ with Brown Paper, or Chalk, or Bricks
“ under them to imbibe the Moiſture.”

In the Margin of this Experiment the Author refers the curious Reader for farther Information to the 7th Book of *Neri*'s Art of Glaſs, *Engliſhed* and Illuſtrated with learned Obſervations, by the inquiſitive and learned Dr *Charles Merret*, but as I have not that Book by me at preſent I can't oblige the Reader with a Tranſcript from that Book. Therefore muſt content myſelf with ſetting down what I have experienced from that Book, and to recommend thoſe who are deſirous to know ſomething of *Neri*'s Method, to the firſt nine Chapters of *Blancourt*'s *Art of Glaſs*, which as near as I can remember, contain what is taught by *Neri*.

The four Annotations ſubjoined to this Experiment I ſhall not need to tranſcribe, as they are only Remarks on the foregoing, concerning the different Effects of the ſeveral Kinds of Salts upon the Tinctures of Vegetables and other Drugs. I ſhall therefore only take a curſory Notice of ſuch Parts thereof as any Ways relate to my Deſign.

Part of this Experiment, and the Annotations thereon, treating of the Method of producing Lakes (as they are called) of all Colours from Vegetables according to the Doctrine of *Ant. Neri*, whoſe Experiments the Author praiſes, I ſhall firſt take the Liberty (ſuppoſing Mr *Boyle* not to have tried them all) to mention, wherein I think *Neri* has left to Poſterity a wrong Account, and where my Learned Author has too much credited him; and then proceed to communicate what has occurred to me upon Tryal, particularly concerning Yellow Tinctures and Pig-

ments

ments having already ſpoke of the other Colours.

I have in my Notes on ſome of the foregoing Experiments taken Notice that the Way of making Green and Blue Lakes from Plants is altogether uſeleſs, if not impracticable, ſo that I ſhall only in a few Words now ſhow, That if Mr *Boyle* had but reflected on what he himſelf ſaid in the Annotation ; ' that Lixiviate Salts, tho' by ' peircing and opening the Bodies of Vege- ' tables they prepare and diſpoſe them to ' part readily with their Tinctures, yet ſome ' Tinctures they do not only draw out, but ' likewiſe alter them, as might be eaſily ' made appear (ſays he) by many Experi- ' ments ſet down in the ſame Treatiſe,' he certainly would not have ſpoke in ſuch General Terms to favour *Neri*'s Pretence to make Magiſteries or Lakes from Rue, and other the like Plants that could be uſeful and acceptable to the Artiſts. It is true, that in the latter Part of the third Annotation on this 49th Experiment ; he does declare ſome Diffidence in the Matter ; but yet, in my humble Opinion, he lays too much Streſs on the Authority of *Neri* and Dr *Merrit*'s Obſervation ; for tho' I will allow that Green and Blue Lakes or Magiſteries may be made from ſome Deep Tinctured Juices of Plants, yet am at the ſame Time certain that they muſt change their Colours in Oyl. But as I believe moſt of *Neri's* Diſciples, as well as myſelf, have, at their own Expence and Trouble too often experienced the Inſufficiency of his Laborious Proceſſes, I ſhall leave this Subject, and go on with what I can affirm from my own Practice to be fact and practicable.

I have already, under the Article of Sap-Green ſhown the Way to make a fine Lemon Colour'd Tincture from that Pigment, ſo need only mention here, that from that Tincture, a beautiful Lake of the ſame Colour is to be made, that is durable as well as uſeful by præcipitating that Tincture with a ſufficient Proportion of Allum Water, and afterwards waſhing off the Salts, and drying as directed in former Proceſſes.

The ſecond Yellow Pigment (called *Dutch* Pink) is made, as before hinted, of the *French* Berries of *Avignon*, (uſed alſo by the Calico Printers) by infuſing Twenty four Grains of them in about three Ounces of Allum Water, and after they have been boiled over or near a ſlow Fire, an Excellent Yellow Tincture will be procured, which (being filtered will ſerve for illuminating Maps, *&c.*) muſt be præcipitated with *Lixivium* of Pot-aſhes and waſhed to Sweetneſs, as formerly directed; but if the Præcipitation is performed with a *Lixivium* of Salt of Tartar, the Colour will be much the better for it, and beyond any Thing that is ſold under the

Name of Brown or Yellow Pink for Beauty, Body and Tranſparency, provided it is not afterwards ground up with cuttle Bone or ſome other Material for Lucre's Sake, by which Means, many good Colours are ſpoiled, ſuch like Things making them grow fat (as the Colourmen term it) and are long in drying, which is a very bad Quality.

The Yellow made from the Turmerick mentioned by Mr *Boyle* in this Experiment is not ſo good in a Tincture as Saffron, and the Magiſtery made from it is not laſting in Oyl, the Sun ſoon drawing it all away as I have more than once tryed: But as a Lake in Water Colours, it may be of ſome Service.

Another Yellow Tincture, that is no leſs uſeful in waſhing and illuminating Maps and Prints, can be made from Gamboge. I know this Drugg is already uſed in the Water Colour Way; but it is only by diſſolving it in Water, which Way I diſapprove, and would by no means recommend, becauſe of it's hurtful Quality, and therefore offer this as more eligible, uſeful, and on all Accounts better.

Take an equal Quantity of Gamboge and Salt of Tartar, powder them together, and diſſolve in a due Proportion of boiling Water, ſo as to make a deep Tincture. When perfectly diſſolved, let it be filtered through Paper, and put into a clean Vial for Uſe.

If it ſhould not be glutinous of itſelf, and be apt to ſink or ſpread, a little thick Gum Water may be added. This Tincture can be made to any Degree of Deepneſs, according to the Quantity of Water that ſhall be employed. The Proportions that I found to make a good Tincture, was twenty four Grains of each Ingredient in half a Pound of Water. It will ſerve all the Intentions of the common Way, and as the Salt of Tartar does in a great Meaſure correct the Acrimony of the Gamboge, it muſt be leſs attended with the bad Effects that are often occaſioned by putting the Pencil in the Mouth. Another Tincture, tho' not a tranſparent one, may be made of this Drugg, with Spirit of Wine and Water; but as I have before obſerved, That Tinctures made with a Vinous Spirit are not very uſeful, did not think it needful to ſet down the Proceſs. There can likewiſe be made from the firſt of theſe Tinctures a Magiſtery; but it can't be uſed in Oyl, and differs ſo little from the Inſpiſſated Juice itſelf, that it is not worth making.

There are many other Vegetables beſides the laſt, (of which Mr *Boyle* takes no Notice) from which Yellow Colours can be procured, the Tinctures and Seeds of moſt Plants having a natural Tendency that Way; but few of them are fine and laſting, which therefore I ſhall forbear to ſet down to prevent Expence and Trouble: Yet there is one that I muſt not paſs over, and that is the Plant called *Woold* or *Weld* in *Engliſh*, and *Luteola* in *Latin*, well known to our Dyers for it's Excellent Uſe in dying Yellow, as any body may be farther informed by having recourſe to the ingenious Mr *Miller*'s *Gardiner*'s *Dictionary*. If this is treated, in the Manner as directed about the *French* Berries, both a fine durable Tincture, and a Lake is made.

Thus much for Yellow; I will now only add two Colours more, that, becauſe of their Affinity to this, ought to be placed under this Head.

The firſt is a Pigment known in the Colour-Shops by the Name of *Anotto*, and is of a deep Gold Colour, inclining to Red. Twelve Grains of this, diſſolved with four and Twenty Grains of Salt of Tartar in four Ounces of Water makes a noble, rich Tincture, which (when filtered) with the Addition of a little Gum Water, is uſeful in all Caſes where a Tincture is required. Of this Tincture may alſo a very ſtrong bodied Lake be made, in the ſame manner as other Magiſteries, which tho' not to be recommended for Painting in Oyl, becauſe it almoſt all flies off in a ſhort Time, eſpecially in the Sun; yet may be of Service in the Miniature and Fan-painting way, to heighten other Yellows, and if rightly managed, will do the Office of Galſtone, the Colour of which it nearly reſembles.

This, I think, is the Drug, which the *French* call *Roucou*, and the *Dutch Orleaan*; and is ſaid to be an Ingredient in that precious Colour, Carmine; tho' I very much doubt of the Truth of the Aſſertion, not only becauſe the *Roucou* would ſhew itſelf as ſoon as the Carmine is put into Water; (for that fine Colour is not made by Præcipitation as other Lakes or Powders are) but becauſe I have ſome Reaſon to believe, that almoſt the whole Proceſs of the Carmine is given wrong by all Authors that treat thereof, there being one Ingredient in it, which is eaſily ſeparated from it, and is very different from any that are mention'd to be in the Compoſition of that Colour, as I ſhall take an Opportunity, (God Willing) ſome time or other, when I have leiſure to make farther Tryals thereon, to acquaint the World with.

As to the *Roucou*, or *Anotto* itſelf, Thoſe that are curious to know farther about it's Culture and Manufacture, may be ſatisfied by conſulting Monſieur *Pomet*'s Hiſtory of Drugs, at the latter End of Book the 9th.

The other Drug I am to ſpeak of is Japan Earth. Of this a Tincture is made by diſſolving in Water only; but if a ſmall Proportion of Alcalizate Salt be diſſolved firſt in the Water it will do ſooner. This may be uſed inſtead of Tincture of Soot which is very diſagreeable, as many other Colours at preſent in Uſe are, in the Room of which

I

I would recommend theſe contained in this Treatiſe, as more elegant and more pleaſant.

Of the Tincture made with the Salt a bright brown Powder is made by præcipitating it with an Acid or Allum Water, and afterwards managed by ſeveral Ablutions and drying as in former Proceſſes.

What this is the Juice of is as yet uncertain; (for that it is the Juice of a Plant, tho' it ſtill retains the improper Name of Earth, is, I believe, by every Body allowed) yet I am inclined to ſurmiſe from ſome Experiments I have made, that it is the concentered or inſpiſſated Juice of Tea, particularly of Bohea Tea, which I have found to yield a Tincture ſo much like the other, both in Colour and Taſte, that I could not diſcern any Difference. I have not, indeed, tried them in the Medecinal Way, (that being out of my Province) but as the Japan Earth is a little auſtere on the Tongue, and leaves a ſweet Flavour in the Throat, ſo does the Tea, and therefore I am apt to believe them originally the ſame: And according to the Deſcription given of both in the Diſpenſatories, they agree in being Aſtringent and Balſamic. To conclude, I believe that if a proper Extract was made of the Tea ſo as to anſwer the Strength of the Japan Earth, it would in Effect appear to be the ſame Thing; but the Tryal hereof I will leave thoſe Gentlemen to whom it more properly belongs, and content myſelf with giving the Hint.

Thus far I have communicated what has fallen in my Way in my Working on Mr *Boyle*'s Experiments, and others of my own, thinking ſome of them might be profitable to thoſe that either do, or are deſirous to prepare Colours for the Limners and other Artiſts; I ſhall only ſubjoin a particular Uſe that may be made of the before going Tinctures, which is to ſtain or dye Paper of all Colours, and then conclude this little Tract, with adding the Proceſs for making the *Pruſſian* Blue; not for the Sake of making that Colour, which I believe is already ſufficiently known, but to teach a Way to make two or three other Colours on that Baſis, with a little Variation and Addition, which has not hitherto been done by any Body elſe, that I know of.

The firſt Thing then, that I purpoſe to do, is to ſhew in what Manner Paper may be died with the before-mentioned Tinctures. To do this well it is neceſſary to obſerve that the Paper muſt be without Stiffning or Allum, as the filtering Paper is prepared. *Secondly*, there muſt be an Earthen, Stone, or Wooden Shallow Trough, a little larger than a Sheet of Paper, made to contain the Tinctures: And, *Thirdly*, the Paper muſt be dipt in the Tincture, which will ſoon ſoak through and when hung acroſs a Line to drain and dry, will be of an even Colour. After it is dry, the Paper may be ſtiffened and glazed fit for Fans and other Uſes; or it may be uſed as it is, according to what it is intended for.

N. B. Beſides this Way of ſtaining Paper, it can likewiſe be performed by the Juices of Flowers, Fruits and Plants, when they are fulleſt; but this muſt be done on Paper that is already ſtiffened, as Writing Paper is; becauſe the other Sort of Paper will imbibe the Juice too much, and be unpleaſant. How ever, this I leave to the Option of the Operator.

Now I will proceed to the laſt Thing I intended, *viz.* to ſet down the Proceſs for making the *Pruſſian* Blue, in *Engliſh*, becauſe I don't remember to have ſeen it publiſhed any where but in one of the Philoſophical Tranſactions of the Royal Society, Nº 381. for the Months of *Jan.* and *Feb.* 1724. where it is inſerted in *Latin*; but chiefly becauſe I intend to ſhew, as I already hinted, what is to be done on the ſame Baſis, for making ſome other different Colours; which I believe is not only unknown to the Public, but even to the Royal Society itſelf.

The Preparation of the Pruſſian *Blue ſent from* Germany *to* John Woodward, *M. D. Profeſſor of Phyſic at* Greſham *College, and Fellow of the Royal Society.*

TAke of crude Tartar and crude Nitre, of each four Ounces; let them be powder'd fine, and mixt together; then put them thus mixt in a Crucible into a Charcoal Fire till it is detonated or melted, and by this Means you will have four Ounces of extemporaneous Salt of Tartar. This Salt being yet hot, let it be gently powder'd, and add four Ounces of Ox's Blood well dryed and powder'd; theſe being well mixt, put altogether into the Crucible and in the Fire till a third Part is diminiſhed; then being cover'd in the Fire, let the Crucible be ſurrounded with freſh Charcoal, that it may kindle by Degrees, and that the Materials may not flame, boil, and burn too violently. In this Manner the Materials muſt remain in the Fire till the Flame and Boiling ceaſes. After that take the Crucible from the Fire, and pour the Matter into an Iron Mortar, and let it be gently pounded; and have at hand four Pounds of hot Rain or diſtill'd Water, in which put the warm Matter, and let it boil for the Space of half an Hour; being boiled ſtrain it thro' a Cloth, and pour freſh Water on the remaining black Matter, which ſet on the Fire to boil, and ſtrain it as before, repeating this ſo often till the Water comes off quite inſipid, which will ſhew that all the Saltneſs and Acrimony of the Materials is extracted. The Reſidue in the Cloth muſt be well preſs'd out, after which all the Liquor muſt be put into one Veſſel, and again ſet on the Fire, till there remains but four Pound, which may be ſet by for Uſe, markt Nº 1.

Then take of *Engliſh* Vitriol calcin'd to Whiteneſs one Ounce, diſſolve it in ſix Ounces of Rain Water, and when filter'd thro' Paper, mark it Nº 2.

Laſtly, Take eight Ounces of crude Allum, and diſſolve it in four Pounds of warm Water, till all is melted. This being rightly performed, join to it the Solution of Vitriol, Nº 2. and heat them on the Fire in a large Pot, to which pour the *Lixivium*, Nº 1. after it has likewiſe been ſeparately heated, whereupon a ſtrong Ebullition will enſue, and there will appear the Colour of Mountain Green or *Borax* (commonly called *Chriſocolla*.) During this Ebullition pour it ſeveral Times out of one Veſſel into another, and when it ceaſes ſet it by to ſettle. When it is well ſettled, pour it into a fine Linnen Filter, that all the Water may drain off, and nothing but the Colour remain in the Cloth. When no more Water drops away, with a wooden Ladle put it out of the Cloth into a ſmaller Veſſel; after that pour upon the Colour two or three Ounces of Spirit of Salt, and there will immediately appear a beautiful Blue Colour, to which, when it has ſtood a Night, muſt he put a large Quantity of clear rain, or diſtill'd Water, ſtirring it well with the Ladle, and when it is again ſettled the Water muſt be gently poured off, and freſh Water put on ſo often till the Water that is decanted is entirely ſweet and inſipid, when the Colour muſt be again put into a linnen Filter, and after all the Water is drain'd off, it may be ſpread on the Cloth, and dried by a gentle Warmth, fit for Uſe.

N. B. Upon the Calcination the Succeſs of the Proceſs wholly depends, for the light or dark Blue, and all Diverſity of Colour, proceeds from the ſlight, midling or ſtrong Calcination of the Blood with the Salt of Tartar.

The warm Liquors muſt be added together at once in the ſpeedieſt Manner that can be.

Now, as from the above Proceſs, with ſome ſmall Variations, three other good and uſeful Colours can be made, I ſuppoſe it needleſs to give the whole Courſe of each of them, and therefore ſhall only mention the Particulars wherein they differ.

To make the Green you muſt put Sixteen Pennyweights of bruis'd *French* Berries of *Avignon* into a Pound of the Solution made with Vitriol and Allum, which muſt be gently boil'd after it has ſtood a Day to make a deep Yellow Tincture, then it muſt be ſtrained and added to an equal Quantity of the *Lixivium* with Blood, as is directed in making the Blue, thus you will have a good deep Green Powder, which muſt be alſo well waſh'd and dried for Uſe, and makes a good Colour in Oyl.

The Purple is made by boiling an Ounce of powdered Cochineal in twenty Ounces of the Solution of Vitriol and Allum, and added to twenty Ounces of the *Lixivium* with Blood, proceeding in all other Reſpects as in making the *Pruſſian* Blue, except the Addition of the Spirit of Salt, which muſt not be uſed for this Colour, nor is it very neceſſary in the Green; unleſs it ſhould be imagined that the Colour can be thereby amended.

The Yellow is made without the Blood; that is, by the Solution of Vitriol and Allum, with an equal Proportion of a *Lixivium* made with the detonated Tartar and Nitre only: but the Operation muſt be performed whilſt the Liquors are freſh. This laſt Colour is alſo of good Uſe in Oyl, but will not glaze.

To theſe Things I might add the Proceſſes of two beautiful and laſting Greens, the one for Limners, and the other for common Uſe inſtead of Verdigreaſe; and likewiſe a fine beautiful Scarlet Lake; but as they coſt me a great deal of Labour and Expence, I can't condeſcend as yet to part with them to the World at ſo eaſy a Rate as the Profit of ſuch a ſmall Treatiſe as this can import, ſo ſhall conclude with only ſaying that I hope ſome People will find it worth the while to introduce theſe Colours into Uſe, which I have not Leiſure to do, to prevent the Miſchiefs that many Artiſts, as well as others, that are conſtantly converſant with the poiſonous now made, labour under, which alone will be ſufficient to make me think my Time, for bringing theſe few Experiments together, well ſpent.

Additional Obſervations.

1. SEVERAL of the Pigments from which the foregoing Tinctures are made, may alſo be uſed for Liquid Colours by infuſing them either in Limpid Water without the Help of any Kind of Salts, or in Roſe-Water, in which the Colours will continue longeſt without growing Mothery; and by tempering theſe Tinctures with thick Gum-Water, which Way will be rather more agreeable and elegant for Gentleman and Ladies, who love to divert themſelves with illuminating Prints and Drawings, or Painting on Silks.

2. Altho' I have hinted that Tinctures made with Spirit of Wine are of no Uſe for the Purpoſes mentioned above, yet there are ſeveral Drugs that yield deep Tinctures in that *Menſtruum*; ſuch as Cochineal, Dragon's Blood, Red and Yellow Sanders, Alkanet Root, Verdigreaſe, *Litmus*, and others, which will likewiſe communicate their Colours to fine, clear Spirit Varniſhes, which may

be employed to varniſh bright Metals, in the ſame Manner as the Gilders lacquer ſilvered Frames to imitate Gold, which is done by the Addition of ſome *Annotto* and Dragon's Blood to the other Ingredients that compoſe the Lacquer Varniſh.

3. It muſt be obſerved, that in making the Tinctures for Lakes, no more of the Salts muſt be uſed than abſolutely neceſſary, becauſe if the *Lixiviums* are too ſtrong they will rather impair than preſerve the Colours, and becauſe alſo, if the Allum Water is too much impregnated with that Salt, as it adds conſiderably to the Weight, (for Reaſons given by Mr *Boyle* in the firſt Annotation) ſo it will at the ſame Time (the Powder, or *Caput Mortuum*, being of a ~~ſtrong~~ stony Subſtance and White) make the Lakes much paler than they ought to be.

4. *Laſtly*, All Juices from freſh gathered Herbs or Flowers are very improper for Tinctures and Lakes, becauſe, whilſt liquid, they will ſoon fade, and quite loſe their Colour; and the Lakes made from them will hardly ever dry on Account of their inherent Salts, which always attract the Nitre of the Air, as appears by Sap-Green, Gamboge, and other inſpiſſated Juices, that grow moiſt in damp, and hard in dry Weather; and for that Reaſon alone, grow fat, (as the Colourmen term it) when mixt or ground up with Oyl.

F I N I S.